

new ANARCHY Series
PAMPHLET 5



graham **PURCHASE**

AGRICULTURE

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New Anarchy Pamphlet Series

This booklet about the possibilities for the reform of agriculture in a future social-environmental anarchy, is one of a number of related pamphlets concerning specific areas of anarchist theory and practice. By anarchism we understand a future society consisting of self-governing communities enmeshed in the ecological dynamics of the bio-region in which they are located. The idea is not to return to small and isolated villages. Rather, we wish that they federate from the bottom upwards upon a regional, inter-regional and intercontinental basis. Eventually this would form a global federation of bio-regions. Inter-regional trade and communication requires transport, telecommunications, postal and power industries. These vital services will be provided by worker controlled industrial unions operating on the basis of public needs and environmental enhancement rather than for profit. Service industries (childcare, laundry, etc) and small trades it is hoped would be organised along communal lines by the citizens of the commune or region. Other titles in the New Anarchy Pamphlet Series concern themselves with some of the specifics of creating such a society. The series includes discussions of *The Green City*, *Law & Authority*, *Mapping Our Green Anarchist Future*, *Money*, and *The Anarchist Revolution*.



Imperialism and the Development of Agriculture

The methods by which humanity has ensured an adequate supply of food have changed greatly throughout the course of history. In the beginning, in those places where food was reasonably plentiful, communities tended to wish to settle there. They organised hunting or vegetable gathering trips into the Forest by day and brought their bounty back to the cave or shelter at night. In less fertile regions, where food sources rapidly became exhausted, the human social group tended to move continually from one place to another. This was often undertaken according to the fixed cycle of the seasons. Such people developed an intimate knowledge of which areas of their range would most likely prove bountiful at a particular time of year. In some parts of the world people preferred to roam-free and preserve the hunter-gatherer way of life. In other places people learned to domesticate the food animals they had formerly hunted. Some of these people became nomadic herders. In more fertile regions, which had allowed for a more settled existence, people not only domesticated wild animals, but learnt to control the production and supply of fruit and vegetable food sources as well.

Herders continue, to this very day, to move in order to provide new pastures for their cattle. However, in many parts of the world; as humanity slowly learned the ancient and gentle art of gardening, a new method of food production, the horticultural community, was born. At this period many cultures chose to give up the nomadic way of life and became increasingly more settled. (This process continues today—though more often than not the few remaining nomadic peoples are forced into settlements by capital, military or state.) Small-scale forest gardeners and low-land village communities continued to hunt for large game and collect herbs, fruit, fungi, fuel and many other products from the wild. As more and more of the forrest was cleared humanity became progressively more dependant upon horticultural knowledge and expertise. The hunter-gatherer or nomadic herding life-style had, and still has, many advantages over that of a fixed and settled way of life. The nomad did not exhaust the soil but continually and seasonally hunted or moved their game to new pastures, therefore allowing the old ones time to recover.

Local calamities or disasters, which can completely destroy a settled horticultural community, present much less of a problem to the nomad. The traveler is accustomed and ever-ready to venture onwards into the broad horizon. Horticultural or gardening communities, nestled in the Forest or scattered over the wide plains, nonetheless proved to be an equally if not more viable way of life for a large number of cultures. Long before the emergence of the great empires the nomadic way of life was on the decline. Humans, since the very beginning of the Neolithic r/evolution, have selectively bred the plants and animals upon which they're dependant. Early horticultural societies soon learned to collect the seeds for next year's sowing from the largest, tastiest or most durable

varieties or specimens. These cradles of horticulture were the genetic homelands of most of our present food-crops. In time the seeds from these early communities spread far and wide. They evolved new strains in response to differing regional conditions. Over a long period of time, this process, far from destroying diversity, tended rather, to increase it. Widely differing regional varieties are a prominent feature of all those places in the world where a settled horticultural or agricultural way of life has developed. This development was not just restricted to plants but applied to animals as well.

In England each county or district had its own indigenous breeds: the Cotswold sheep, the Norfolk ram, Hereford Cattle, the large spotted Gloucester (orchard) pig or the curly coated Yorkshire pig are all examples of a delicate and sensitive regional relationship between agriculture and environment that prevailed in Europe right up until the end of the 19th century. Regional difference in disease, pests, climate, fertility and topography, has greatly influenced the bio-evolution of the breeds.

The military state which was made possible by the success of horticultural and gardening societies set about to destroy them. In what is now known as Zimbabwe, Iraq, Egypt, Mexico, India, or Cambodia, for example, the societies became Empires and the Empires over extended themselves. Famine and disease saw them collapse. Likewise, the Greeks, Romans and all the subsequent Empire builders of Europe, in order to feed their armies and swelling cities, forced by means of the whip, shackle and gun, the natives to give up horticulture, and practice agriculture instead. The trees were cut down and rooted up by armies of slaves, oxen and horses, who, to the slash of the whip and rattle of the chain were sacrificed to the needs of imperialistic agriculture. The imposition of taxes upon grain and meat by the imperialist conquerors proved in most cases a less overtly violent way of getting the natives to adopt agriculture and grow food for their masters.

In the Americas, slaves, imported from Africa, were forced, under the most dreadful conditions, to lay bare the land. They were then forced to grow the food necessary for the relentless greed of American nation builders and the blood-thirsty lust of the Europeans, for global conquest. The fencing of the commonlands in Britain in the Acts of Enclosure, show us, however, that the imperialist elite, cared no more for the welfare of their own peoples, than that of others half way across the world. The State enforced collectivisation and industrialisation of the peasant commune by the Bolsheviks during the early twentieth century, to the enforced movement and resettlement of the natives of the Amazon and S.E. Asia at its end, are all examples of how the interests of capitalism and/or state, have made the people landless, for profit, greed and power. Once the initial pillage of the people and their forests or lands has been completed, agriculture, a fast bucks driven pillaging of the soils, invariably follows. The free gardeners and hunters becoming landless wage-slaves under the yoke of the state-capitalist

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landowner. Although indigenous peoples continue to fight abuses and for control of their lives, many died of disease and others slunk off to the mountains and few remaining pockets of forest, to die in grief. State-capitalism is relentless in its' thrust towards ever great levels of monopoly, power and control over society and nature. The state-capitalist project of taking total control over the entire basis of life continues ever more rapidly. Having near universally destroyed gardening and horticultural societies through the imposition of agriculture; state and capitalism now threatens to secure its total domination of the land through corporate takeover and industrial bio-technology.

Capitalist Corporatisation of Agriculture

The technocratic take-over of agriculture began in the 1930's and 40's when government and/or corporate backed scientific elites first attempted to engineer new high yielding variates of basic food crops by means of genetic engineering. In the 1960s, the bio-technical project was heralded as a 'Green Revolution' by the captains of global industrial capitalism. Initial successes in Europe and North America led to the absurd idea that the 'third world' could be given a ready made pre-packaged agricultural revolution. This was not only going to "solve world hunger", but also, make staggering profits for the Directors of seed and chemical companies. "How nice" they proclaimed "to be doing the world a favour whilst making an honest buck". However, beyond the desire for profit the technocratic elite had much more sinister motives. Struggling third world farmers, were in many respects, used as guinea pigs for the hair-brained schemes of state-capitalist technocrats.

The green-capitalist revolution was from the beginning an outrageous combination of incomplete scientific knowledge and a hard-nosed chemical sales project. The 'super-crops', unlike regional and local varieties, were often not drought resistant, or susceptible to local and unforeseen pests. After paying for all the numerous fertilisers, herbicides and fungicides, as well as for the extremely expensive seeds—all generously supplied by the chemical companies—the super-variates more often than not died through lack of water. The scientists retreated to their laboratories to plan the green-capitalist revolution MK II. They were funded by fat research budgets bought at the cost of third world hunger. Over time the technological-fix was patched-up, and new variates were created that could grow on quite marginal soils, but production continued only by means of large-scale inputs of chemicals, water, and fertiliser. The 'improved' crops, were more honestly renamed "high response varieties". This is to indictate the fact, that these varieties, only gave 'higher yields', when they could be lavished with expensive inputs.

The farmer who had abandoned local variates, and time-honoured methods, had become a slave to the corporation. Unlike traditional "open pollinated" varieties, where the farmer could save the seed from the previous years harvest,

the seed from these improved strains, needed to be bought anew each year. Because of the uniform nature of improved strains, fast-breeding diseases were all too easily able to decimate entire crops. Consequently new resistant strains have to be bought each year, just to keep up with the ever evolving nature of the disease. The new short-stemmed varieties do not produce straw which had previously been used for thatching, bedding or animal feed. The chemicals used to grow high response varieties also tended to kill off useful animals and plants. These had a beneficial, and often symbiotic relationship with the crop plants. Moreover, they provided villagers with a wide variety of food sources as well. The rhetoric of revolution, became a source of embarrassment and the sales pitch less triumphant. Nonetheless the scientists had learned a great deal from their field experiments. The chemical companies had amassed fortunes. The technocracy had succeeded in shackling their clients to the trans-national capitalist treadmill.

In the rice paddies, frogs, fish, edible aquatic plants (water chestnuts, taro & spinach), aquatic green manures (azolla), and freshwater crabs, which had collectively controlled weeds & mosquito populations and provided nitrogen & other vital fertilisers, disappeared overnight. The dead fish and other animals had not only given humans a vital protein supplement, they annually fed the soils of the paddy fields, when they died, en masse, every dry season. Ancient and sustainable forms of aquaculture were thus poisoned, and then abandoned, in pursuit of transnational corporate profit.

Meanwhile in Europe and North America the new high yielding Variates had been deemed "extremely successful". Indeed agriculture had become dominated by a relative handful of new super-strains. This is no accident. It was the deliberate result of government policy. In Britain for example, the 1964 seed act, made it illegal to sell seeds, of any variety, which failed to sell more than one thousand packets in any one year. The general thrust of the legislation was to bring British agriculture in line with general E.E.C. policies. These quite explicitly favoured the "standardising" vegetable varieties, throughout all of Europe.

As a very young boy and a keen gardener I clearly remember dragging my father to the Natural History Museum in London, to hear a popular lecture, given by a representative of the Henry Doubleday Association, upon the subject of plant diversity. My heart was torn apart by the earnestness of the speaker. He told of the old English Soldier Bean, of ancient variates of giant cattle Kale and Rhubarb which it was no longer lawful to distribute. He spoke passionately of the 6000 variates of Apple and the 95 named variates of Rhubarb available at a nineteenth century English market; Of how this rich genetic backdrop from which the modern super strains had been singled out, was threatened by the narrow, misguided and aggressive agricultural policies of capital and state. His most poignant example was that of the tasteless, odd-shaped and over-sized cattle carrot. This had been made extinct as a direct consequence of the 1964 Act

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before it was subsequently discovered by the foolish technocrats to be resistant to carrot-fly. A pest, I believe, still accountable for around 30% of crop failure in Europe. Capital and state, the speaker surmised, were not only unnecessarily eliminating genetic diversity, but couldn't even be trusted to produce their new super-variates with any degree of competence. He concluded that the elimination of diversity was most likely to end in ecological catastrophe and that it may be necessary to "break the law" by distributing threatened variates informally. He appealed for funds for their seed-bank and talked of the difficulties and expenses and method of preserving these ancient, hardy and trusted vegetable and fruit variates. I was appalled by what I had heard and upon returning home drafted a letter upon species diversity. After persuading my mother to neatly type the letter I sent it to the gardening magazine which I bought from the newsstand every week. I never had my letter published (my first attempt at ever publishing anything) and I never received a reply. It was only years later that I realised how dependant such popular gardening magazines were upon the advertising of the chemical and other related industries. It still astonishes me how little discussion of the really important political issues in horticulture occurs within the pages of them.

Seed banks have not however been as successful as the scientist might have wished. Often the stock was not representative, or was poorly labelled. These problems have often been compounded by power failures and famine in third world countries. Because pests and fungi are always changing and evolving, one batch of seeds may not be resistant to a strain of the same pest in 10 years time. Likewise a highland variety, when regrown in a well watered lowland environment, with a high input of chemicals, may soon shed those characteristics which made it important in the first place. Plants respond to environmental changes much more rapidly than was at first supposed. After a few grow-outs the seeds start to adapt to the local environment. Moreover only those seeds that are able to withstand years of freezing in the seed-banks' artificial conditions would germinate. Seed banks cannot preserve the germ of life indefinitely, and the seed has to be planted and collected again. This is often enormously expensive as in order to avoid cross pollination they have to be grown in cages or enclosures. Likewise, in order to collect a representative sample it is necessary to plant a whole field. The cost meant that usually only a handful of seedlings could be grown leading to genetically unrepresentative samples. In the past an individual English apple orchard frequently contained as many as 200 widely differing variates. By 1986 90% of all culinary apples grown in England were Bramley Seedlings. Meanwhile rain-forests and other large genetic reservoirs of life are being constantly destroyed by capitalist development. Existing agriculture is becoming increasingly standardised. Many of the original high yielding variates were however developed from a tiny patch (the size of a football oval) of wild wheat in a South American rainforest and from ancient seeds preserved for

thousands of years in burial chambers. The wild-carrot and wild-cabbage, are in Britain, now found only upon Salisbury Plain (and other such places), which has for many years been used as a military firing range. Consequently no agriculture has been undertaken. If the modern varieties fail, it may perhaps be necessary to rebreed, from their original wild and more vigorous ancestors. Unfortunately these are rapidly becoming extinct. Homogeneity is a source of weakness not of vigour and of strength. The desolate populations of Easter Island or the starving cottagers in the great Irish potato famine of the 1840s are testaments to the truth of the widely acknowledged principle of: 'strength through bio-diversity'.

The conditions for life vary enormously in every region. Sustainable agricultural success is dependant upon preserving regional varieties in the region where they have been grown for centuries. The surest way to prevent regional extinctions and eroding biodiversity, is to encourage the people of that region to keep on growing their traditional crops. The need to forestall genetic erosion led the Agriculture Committee of the European Parliament in 1991 to establish a scheme to conserve plant genetic resources. It recommended that European gene bank programmes and non-governmental organisations establish a 'crop network'. In recent years groups of gardeners and farmers all over the world have established seed-saving networks in order to counter the folly of capital & state. It is debatable whether 'seed-savers' networks and clubs should respond positively to governmental support or interference. It is necessary to preserve access to these varieties to gardeners and not agricultural bureaucrats in governmental plant breeding institutions. Humanity will not be well served if millions of seed savers, saving seed in every region and every conceivable micro-climate, are replaced by a few governmental researchers in the capitol.

The Techno-Genetic Transformation of Industrial-Chemical Agriculture

Although the 'green revolution' utilised genetically selected and uniform varieties, the level of technical sophistication with regard to genetic engineering was minimal by today's standards. The 'green revolution' was more a product of the chemical industry than of genetic science. Since the 1970s, the spectre of genetic capitalism, has, with the rapid development of gene transplantation technologies, begun to cast an ever larger shadow over all of free nature. The Techno-Genetic Transformation of industrial chemical agriculture is moving very rapidly. Capitalism has been quick to realise the money making potential of the staggering advances in bio-technological knowledge. The creation of genetic capital through the patenting of seed varieties in the British Plant Breeders Act was seen as a breakthrough for capitalist bio-technology, who now had the right, by law, to actually own life!? In the first week after the Plant Breeders Rights legislation was enacted, Rank Hovis McDougall acquired 84 seed companies. The last decade has seen an expansion of biotechnical research and genetic engi-

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neering. Unable (yet) to interfere with human evolution, the technocracy has nonetheless seen fit to interfere with natural plant and animal evolution. The genetic reprogramming of the countryside by industrial bio-technology is being seen as one of the great new growth areas for capitalist exploitation. The aggressive development of new synthetic breeds or variates, and related agro-technologies, is now one of capitalism's highest priorities. Capitalism advances through the elimination of competition and market diversity and the creation of monopolies.

Millions of plants and hundreds of thousands of farm animals can be raised from a single seed or egg. By owning the seed variates, the technocracy can control what fertilisers and control measures that must be used to grow them. State-capitalism's bio-technical project involves eliminating natural and regional bio-diversity, indeed any genetic combination which constitutes an obstacle to its progress. By destroying wilderness and turning the land over to biotechnologically engineered agribusiness, it seeks to reorder the natural world according to the logic and interests of capital and state. The Earth and its inhabitants might be redesigned as commodities, whose shape, form and function, in the megamachine, will be pre-conceived by capitalist production planners in advance of their creation. Progressive waves of capitalist bio-technology would have to program and reprogram nature according to genetic "breakthroughs" and "improvements". The criterion for development being profit and monopoly. Beginning with our agricultural plants and animals the ultimate-end of such a process is the reprogramming of all of living nature. Everything will be duly patented and controlled by the technocratic elite. Our children will no longer be born into nature, but rather, each successive generation may have to update the program. The ultimate Earth-vision of the modern transnational food corporation appears to be a landscape of ten foot grass eaten by cows the size of elephants. Every grain of wheat, every cow, as well as every hamburger salesperson, identically cloned with one another. A society composed of identical frankensteins controlled by monstrous manipulators.

Although hopefully we shall never be forced to live upon such an absurd and desolate Earth, we cannot but conclude that this process is well underway.

If humanity wishes to run its society in a technological manner using environmentally sensitive industrial processes, then so be it. Moreover, I am firmly convinced that genetic science and information and communication technologies, if used by communities (and not by governments and military elites) for the benefit of all of humanity, might be of immense value in prospering worldwide peace and co-operation. What life-ways we as a species choose to adopt, in the human social-realm, providing that they do not cause environmental harm, is a matter for each human community to decide for itself. But, just because we may choose to organise our social-life technologically, is simply no grounds for reorganising the whole of nature. To impose our chosen form of life-

style upon the rest of nature, is to make the great 'becoming' of life, into a machine. A machine that is programmed to benefit just one of the many millions of species that inhabit the Earth. A machine, moreover, that does not even benefit all of humanity, but merely lines the pockets of handful of capitalist technocrats. Technocrats who are set to gamble with the whole of life on Earth, for short term pleasures, power and self-gratification. The mechanistic world view, which has dominated human industrial culture, has been thoroughly debunked. The universe is not some giant clock designed by God. Plants and animals are biological and do not grow, evolve and function, according to abstract mathematical or mechanical principles. The capitalist techno-genetic remodelling of nature into a machine, that produces bulk food for mass human consumption, is an attempt to make biological reality fit the theory, by changing the very nature of biological reality itself.

In Australia the dairy industry cannot even design a bio-degradable and non-polluting milk carton. Even the cardboard ones, are lined with plastic. This plastic, is not only non bio-degradable, but discharges extremely toxic chemicals when burnt. If the technocracy cannot even be trusted to devise a safe milk carton, we should perhaps have little faith in their ability to manipulate and irreversibly alter the genetic make up of our most basic food sources in a successful and unproblematic manner. If the mass of humanity allows capitalist bio-technology to eliminate wild nature, and reprogram agriculture, we shall not be simply taking a dangerous gamble, but most likely be committing suicide. This is genocide rather than genius.

Thankfully, interest in indigenous and regional breeds of animals and plants, developed over hundreds or thousands of years, has greatly increased in recent years, and this is particularly true of the third world. In Botswana the native herders have abandoned the new super-breeds in favour of their own swamp cattle. These, like their goats and sheep, are completely resistant to heartwater disease. Even in Somalia, the people had seen the need in advance to store indigenous strains of millet in neighbouring Kenya's seed bank. In the course of the war & famine the Somalian seed-bank was ransacked by starving people. At the time of writing, agricultural aid workers were negotiating to buy indigenous seed from some farmers, who have managed to successfully grow crops along certain rivers. The aid workers plan to distribute the seed as widely as possible. They have recognised the fact that the extremely hardy and drought resistant indigenous varieties of millet are likely to succeed. The imported varieties, from outside of the region, may not. Such examples are evidence of the fact that agricultural aid workers, and scientists, assisting farmers on marginal or difficult terrains, are increasingly focusing on local varieties or strains, rather than trying to adapt or improve upon imported ones. In Europe also, interest is growing in maintaining the small remaining herds of indigenous livestock. This has been undertaken in a conscious effort, to forestall the tragedy that the technocratic

takeover of agriculture is almost certainly destined to create.

The ability to manipulate genes has reached new heights in recent years. The genes that allow a fish to withstand icy waters can be transferred to beans or tomatoes, in order to give them a similar resilience to cold air. The gene which causes the firefly to flash has been successfully transferred into tobacco. The genes of unusual plants that are able to withstand large applications of herbicides and other human chemicals are now being introduced into our food crops. In Australia the CSIRO has developed crops that can tolerate dosages of herbicides up to eight times the recommended dosages. In Northern NSW they are breeding cotton plants with star shaped leaves to allow more of the pesticide to reach all of the lower leaves. Here they are also experimenting with genetically engineered bio-pesticides. This is the new generation of pesticides that confer plants with a built-in resistance to insects. Using trans-genic techniques they are transferring the genes that produce insecticide crystals in naturally occurring bacteria into the leaves & buds of the cotton plant. The plant then creates its own insecticide crystals which appear on the surface. The scientists claim that the crystals are not poisonous to spiders, birds or fish. But can we be sure? May not these bio-pesticides, like chemical pesticides, eradicate beneficial insects. This would take us ever further down the road of total and irreversible dependence on pesticide use. And what if these genes that express bio-toxins begin to find their way into other plants and weeds? Thereby worsening weed problems and necessitating ever more ingenious and dangerous control measures. Genetic pollution may, if this trend continues, become the next great pollution issue. Biological or genetic pollution may cause even greater problems than the chemical pollution with which we have been familiar up to now.

In order to serve the profits of agribusiness, plants are bred to resist or enhance the effectiveness of chemicals which the plant requires to mature successfully. This is actually changing the environment of the Earth. It is outrageous that when parents are demanding chemical free and protein-diverse natural products, bio-industrialists and technocrats are designing plants specifically bred to tolerate higher and higher levels of fungicides, herbicides and insecticides. Likewise tomatoes are now bred to withstand long truck journeys. In Australia this may often be a journey of over 1000km. Plants are thus bred in order that they can perform within the high energy food distribution system (which is ultimately unsustainable) that is favoured by industrial capitalism. Likewise, villages in the past generally favoured crops that matured over a long period, thereby giving them a long period during which they could collect fresh food. These days crops are bred so as they all mature at exactly the same time to meet the requirements of a food-processing industry which demands certainty and standardisation.

Humanity interacting with the differing regional ecologies of the Earth has for thousands of years influenced the genetic make up of the animals and

plants which they have grown or farmed. Rather than respecting local or regional difference the technocracy plans to exploit it. For example, certain plants and even small animals in very arid desert regions can produce a sugar that literally preserves life in suspended animation, in the absence of water (This field of biology and botany has recieved a lot of interest in recent years and is now known as crypto-biology). By taking genes from these plants and putting them in commercial food crops it is suggested that we will be able to grow wheat in the most arid waterless regions. Strawberries could be bought dried upon the supermarket shelf. With the addition of a little water they would become fresh and tasty once again. In this way, the technocracy, by means of genetic engineering, plans to use the highly specialised features of plants from widely differing bio-regions, to produce a small number of synthetic biologicals, appropriate to broad climatic differences, rather than attempting to help the people in each and every bio-region develop and preserve their own indigenous strains.

Every gardener who has consciously saved seeds over a number of years, knows that a successful strain, grown on the same ground for several years, is stronger and more resilient to disease. When this tendency is multiplied by regional differences over centuries, the benefits, and properties, of such plants, are likely to be far more valuable than engineered ones. No amount of tinkering, by state-capitalist technocrats, is in my opinion, likely to improve upon thousands of years of thoroughly tried and tested regional and indigenous variates. The Earth, and its soils, are not uniform like that of a factory floor. Abstract and synthetic variates, concocted in a laboratory in California, have no connection with differing regional ecologies. They are unlikely to succeed in the long term. If the modern genetic engineer wishes to play with life, why not let him or her play with flower gardens. But not with our food and animals. I challenge them to better the beauty and scent of an English rose garden. The creators of which knew nothing of D.N.A. and gene manipulation.

That modern agro-technology has become a positive threat to our survival is everyday becoming clearer. Industrial agriculture has never been the friend of the soil. As inappropriate agro-industrial procedures have become integrated with inorganic chemistry and genetic engineering, the catalogue of its disasters grows thicker, with every passing day. In the week that I am writing, I hear of more than 20 babies being born without eyes in Northern England. The local application of a particular agro-industrial chemical has been blamed. Meanwhile studies at outlets into British rivers has confirmed, what has long been suspected: that growth hormones used in agricultural production are entering the water and actually changing the sex of the fish in the rivers!? Everyday modern agro-technologies are seen to have caused a new problem. Another catastrophe has to be averted. One can imagine that the continual shifting of biological material, from one species to another, will result in the breakdown of natural species boundaries. This might lead to a crippling of life, perhaps result-

ing in the creation of global gene chaos. Accidental gene transfer is already a reality. For example, in one case, the genes of a lettuce engineered to tolerate herbicide, has somehow managed to be passed on to a noxious weed, the wild prickly lettuce.

The technocratisation of food production is deemed necessary, precisely because industrial agriculture has proved to be an abject failure. The people must thwart the state-capitalist technocracy's takeover of nature. The people must reverse the agricultural revolution through adopting local, community based methods of food production, through intensive horticulture, and small organic farms or market gardens, each growing a wide variety of native produce. Whilst carefully preserving and extending regional wilderness areas, in which genetic material is pooled, we must create in our rural and urban places, edible landscapes, picturesque farms and self-sufficient suburban communities. In cities, vacant lots must be turned into community orchards. City children must be able to pluck nuts and berries from suburban hedgerows and trees. The people shall repopulate the land. They will claim for themselves a fair-share of the corporate holding. We would hope to see a very, very much larger number of smaller farms growing a wide variety of crops.

Every gardener and farmer will preserve their treasured seeds. Even the smallest village might be growing 200 variates of cabbage. Genetic diversity, creating an agricultural environment where really exceptional genetic encounters, and positive mutative developments, can occur naturally and spontaneously. The Brussels sprout was not bred by bio-technocrats and scheming capitalists. It just turned up one day in a Belgium farmer's cabbage patch. And now the capitalist technocracy, has the audacity to claim, that a genetically improved variety of the plant should be patented, and exclusively owned by them!!! Nature is intrinsically creative. When it is combined intelligently, with diverse, regionally based horticultural approaches to the land, it is spontaneously capable of producing all the genetic encounters necessary for a healthful and bountiful harvest. Mixed community agriculture, companion planting and infinite variety, are absolutely necessary for the creation of beneficial marriages, within and between varieties and species. It is the only sure guarantee, for genuine and lasting progress, in the production of human food requirements.

Environmentally Sane Approaches to Food Production

Horticultural or gardening communities in the recent past, have been regarded as inferior to societies based upon agriculture. Extensive and large scale agricultural techniques that have characterised civilisation, in both ancient and modern times, have been regarded as more advanced and efficient methods of food production. This view is undoubtedly changing. The desolate, treeless expanse of the Australian wheatbelt is being seen by more and more people as an unacceptable approach to our land and soils. The few remaining large gums,

unable to draw the salt down to deep soil levels by themselves, perish as the salt rises through our ravaged and degraded soils. The use of chemical rather than organic fertilisers, and the use of genetically uniform strains, greatly reduces the variety of proteins and minerals to be found in the eventual crop. The treeless windswept landscapes that characterise many of the world's agricultural areas, have led to soil erosion and simplification. This is an extremely fragile basis for life. "Every loaf of bread", we mournfully say in Australia "has lost us several kilos of our precious soils to the wind forever!"

Archaeological excavations in Libya and other places in North Africa are revealing lost civilisations of hundreds of thousands of people. Their inappropriate use of the land eventually led to their cities being buried under the shifting desert sands. These people, with comparatively simple technology, managed in a relatively short time, to completely destroy the organic basis upon which their survival depended. As agriculture became industrialised, first by the traction engine displacing the horse and ox, and later by the combine harvester and motor-tractor, the potential for global ecological catastrophe has increased dramatically. Forty per cent of the world's top-soil has already been lost since the industrialisation of agriculture and modern agri-business. This can only be described as a systematic assault by the interests of capital and state upon the integrity of our soils. Whilst the fields remained small and were numerous interspersed by hedgerows, copse, pasture and woodland, the overall effects of the agricultural plough, was, by current standards, minimal. Moreover, traditional peasant and agricultural communities practiced complex cycles of crop rotation. Fields were often left to pasture for several years in order that the land might be fertilised by animals. The soil was thereby allowed to regain its organic vigour.

Agri-business however, turned whole farms into a single field ripped up the hedgerows and the copses, to squeeze every last metre of "productive" land from their corporate holdings. In many places the same crop may be grown two times a year, year after year, without leaving the land to recover. This contradicts crop rotation practices developed over thousands of years of agricultural history. The use of inorganic fertilisers, rather than traditional organic composts and wastes, is polluting our ground waters. Modern industrial-agriculture has slowly turned the soil into little more than an inert growing medium. It is more akin to moon-dust than living earth. The cumulative effect on the health of our soils of fungicides, pesticides and herbicides, necessary to maintain extensive monoculture, is incalculable. When is this madness going to stop? When will humanity learn: that those societies and civilisations of the past who have abused their soils have not even lived to regret it!? This suicidal process of land degradation has to be reversed. The adoption of proper farm design, agro-forestry and organic cultivation is becoming a necessity rather than a choice. Let us examine some of the ways we may achieve more organic and sustainable farming practices:

Integrated Farm Planning & Design

It is difficult to write in *general* concerning the great changes that must be made in agriculture. The differences in landscape within a single bio-region are often very great. Examples of suitable plants or systems, are as a matter of course, restricted in their application due to the wide variety of different environments on Earth. A tropical plant is usually unsuitable for a temperate environment, though a greenhouse can modify climate conditions. More often than not, a particular system is applicable to a particular situation. To talk therefore, of agricultural reform in global or abstract terms is, from a bio-regionalist perspective, somewhat contradictory and absurd.

There is however one fundamental principle to sound farming practices. This can be designated as integrated Farm Design & Planning. This simply involves looking at all the available land as an inter-related whole. Rather than looking at the land in terms of beef or grain production and devoting our energies narrowly to this one pursuit, the farm should be viewed from many viewpoints. How might it be possible to use those parts of the land which are more unsuitable for pasture or field crops to better use? Instead of working against nature how would it be possible to work with it?

Micro-climates, slopes, rivers, valleys all offer different advantages and disadvantages. The farmer must seek to take maximum advantage of all the various features of the land to obtain a multiplicity of useful crops or benefits. These can be connected or integrated with one another to form a sustainable farm-ecosystem. Ideally, one that requires no external inputs to maintain the fertility, productivity, & stability of its soils. Farm buildings and facilities rather than being clustered around the farmhouse should become located in the area where they are most appropriate. This will waste the least energy and time. The best place to put a shearing shed for livestock grazed in a cherry orchard is most likely to be in the orchard itself. Likewise, dwellings should be situated in places where they are most likely to sustainably obtain energy, water and warmth.

Let us take for example an equatorial facing hillside with a gentle river valley at its bottom. The low-lying areas closest to the river which are subject to flooding are generally best left as meadowland. They should be planted with trees which are water tolerant such as Tea Trees or casurinas. Above the flood level, on the gentlest lowland slopes is the area most likely to be suitable for arable crops or for mixture of orchard and grazing. Buildings can be placed on a gentle slope facing the sun above the level where cold damp air can collect overnight and below the hilltops where frost is likely to be a problem. The steeper land behind the house should be forested whilst food forests or mixed orchards are best placed on the more gentle slopes in front of the house. Flat hill tops, if planted with suitable windbreaks can be used for grazing or for the generation of wind energy. Intensive horticulture, which requires a great deal of attention every

day, is best placed on natural or artificial terraces, in the close vicinity of the house. On a downward flowing river, where there are natural waterfalls, small dams can be constructed to form alpine lakes. These can be used to generate power by low-head hydro-electricity micro-stations. In our example, however, the only regular water flow is a stream at the valley bottom. Simple, modern water pumps that can be easily maintained by the householder have been developed in recent years. The Glockemann ram pump which "uses the force of water acting on a rubber diaphragm to push water uphill, is able to convert a lot of water falling as little as 0.5metre into a little bit of water raised up to 200 metres" (Soft Technology #53 p.40) By means of ram pump, which is able to pump water uphill through utilising the energy of the stream's flow, water can be moved up to a water tank or storage lake in a suitable place near the top of the hill. Where the option of a lake is chosen, the raising of waterfowl or fish becomes a possibility. From here the water can be supplied to the farm house and surrounding gardens and fields by gravity. By using all of the elements of the farm-scape to achieve a multiplicity of outputs that are useful to one another, the land can be made many, many more times productive than modern agri-business would like us to believe. A nut orchard here, a field of grain there. A carefully landscaped fish pond growing edible plants with ducks, geese and other waterfowl peacefully gliding about upon its surface. A few dairy cows, kangaroos or emus scattered amongst paddocks charmingly shaded by ancient trees. Around the house a sizeable chicken run and a small market garden, growing every conceivable herb, vegetable and fruit for house and market. The honey-bee hives tastefully dotted throughout the lemon gum grove, providing sweet honey for delicious confectionery in the long winter ahead.

These ideas are not new. The eighteenth century French anarchist thinker Charles Fourier in his half-crazy schemes, for a green and harmonious society, always stressed the need to elevate and reintegrate gardening into a vital part of everyday life. His insistence upon the absolute necessity of extreme diversity, inter-mixing and novelty is characteristic of all his writings upon horticultural production. Fourier's ideas about how federations of socially diverse horticulturally based communities would necessarily create a fertile breeding ground for interesting "encounters" and "marriages" between different people, plants and animals, remain relevant today, despite a distance of 200 years:

In order to invest agricultural work with intrigue, charm and variety...society crops will be divided into three interlocking categories adapted to various localities:

1. The simple or massive category is the one which precludes any mixing of localities. It dominates our regions of large scale agriculture where fields, forests, meadows and vineyards are grouped in large masses.
2. The ambiguous or vague and mixed category refers to the confused or so-called "English" gardens which were actually invented by the Chinese. This

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method gathers together as if by chance all sorts of plants. We use it on a small scale, but it is never applied throughout a district. Harmonium will make great use of this method because it beautifies the countryside and generates industrial charm. The present large masses of meadows, woods, or fields will lose their sad aspect when the ambiguous order is used.

3. The linked or compound order is the opposite of the civilised system of enclosures and fences. Each agricultural series will make an effort to cultivate various areas. It will throw out advanced rows and up detached plots whose centre of operations is distant from its own. As a result of this mixing which will be adapted to the terrain, the district will be dotted with agricultural groups. The scene will be animated, the view varied and picturesque. The Massive order is the only one used by civilised farmers. They grow all their grain in one area, and then in their individual vegetable gardens they abuse the linked method by accumulating twenty kinds of plants where there should hardly be three or four. When a community farms its land under the combined system, it begins by determining three or four uses suitable for each section. Crop-mixing is always advisable except in very valuable vineyards. Yet even these can bear fruit and vegetables as accessories to the pivotal crops. Each branch of agriculture, consequently, strives to establish itself among the other branches. The method of linkage is attractive to the eye, but is also useful because it helps to mesh the passions and foster intrigue. A great deal of care must be taken to arrange the marriage of groups, or encounters brought about by the linking. The purpose of crop-mixing is to bring various groups together and provide them with encounters which will evoke interest in the crops linked to theirs. In this way the isolation imposed on each group and its work is kept to a minimum. (The Utopian Vision of Charles Fourier, London, 1972, pp.291-2)

Let us now look in detail at some of the practical ways in which sustainable forms of mixed organic farming might become a living reality:

Green Manures:

Green manuring is not a modern fad. Its use has been recorded in ancient Chinese and Roman agriculture. Green manures are usually only suitable for high rainfall areas. They are usually classified into Leguminous and non-leguminous varieties. Depending upon the purpose, green-manures can be harvested at both mature and immature stages. They can then be used as an animal fodder, a mulch on the surface, or dug into the top few inches of the soil, as an organic fertiliser. Green manure crops are often divided into 'cover crops' and 'catch crops'. A cover crop is used to prevent or reduce erosion and weed infestation. The green-manure is dug in before the main crop is sown. A catch crop is used to prevent or reduce leaching. Deep rooted and vigorous green manure plants, are able to catch nutrients that would otherwise drain from the soil or by utilising nutrients that less vigorous species cannot take up.

Green manure crops improve the physical structure of the land by in-

creasing the levels of organic matter in the soil. Organic matter is decomposed by small animals and plants into humus. This interacts with other soil components to form soil aggregates. The presence of soil aggregates creates a good mixture of particles and voids. Widely varying soil particle sizes creates land that is more resistant to soil erosion, and which allows greater amounts of water and air, to enter and percolate throughout the soil. Deep rooted green manure crops also allow for greater air and water circulation. This is because of root penetration to deep levels in the subsoil. More generally green manures can reduce crusting of the soil surface, improve the friability of heavy clay soils, and retain more nutrients and water in sandy ones.

Traditional North European agriculture included a fallow period. This has several disadvantages. There was often a high nutrient loss through leaching and surface erosion (especially if overgrazed). Likewise, the soil is often vulnerable to erosion in the immediate post cultivation period. Nutrients supplied in organic green matter are recycled in a mineralised form. This reduces the potential for leaching from the soil. A soil that is high in organic matter is also able to resist undesirable pH changes. It creates soils which is less prone to damage when cultivated. When green manures are used as a cover crop they can be used to conserve fragile soils. Ryecorn, for example, is noted for its dense, deep root system, which will stabilise drifting sands.

Most people know that leguminous plants, when used as a green manure, are able to provide additional nitrogen through acting as a host to nitrogen fixing bacteria. Green manures can also provide additional potassium and better utilise less available forms of soil phosphate (due mainly to the vigorous growth and root system of many green-manure plants). Rapid decomposition also releases large amounts of carbon dioxide leading to temporary increases in phosphate availability. Standard agricultural fertilisers consist of nitrogen, potassium and phosphorus. Thus green manure crops can replace or supplement the application of artificial fertilisers. It has however become apparent that plants require a full spectrum of minerals and nutrients. Unlike traditional agricultural fertilisers green manures are able to provide these. Organic matter from green manures enhances the process, known as cation. This describes the interchange of ions between the soil solution and clay, or other organic matter complexes in the soil. An increased soil cation exchange capacity, creates a greater availability of important trace elements, such as calcium, manganese, iron, copper and zinc, in the form of positive ions.

Green manures are also important as a management tool. Increased organic matter makes the soil darker. This raises soil temperatures in the spring, assisting plants to make earlier growth. Green manures can also assist in weed control, by competing or smothering weed infestations. Vetch (woolly pod), for example, is a prolific grower with a dense soil cover, that will choke out weeds. Obviously vetch should not be allowed to seed or it may itself cause a weed

problem. Green manures can help control plant diseases and insect pests and reduce the need for inorganic fungicides, herbicides and pesticides. For example, 'Take-All', is a fungal disease of cereal crops which requires cereal roots to survive in the soil. Its' survival can thus be reduced by introducing a legume between cereal crops. Oats are an ideal green manure rotation crop, where the pest worm nematodes are a problem.

When green manures are employed within an integrated farm system, it is possible to develop sustainable forms of agriculture, which minimise ploughing and reduce or eliminate the need for artificial chemical inputs. One such example is the clover/sheep/cereal system that has been developed at the Institute of Grassland & Environmental Research in Berkshire, England. The system produces a wheat or barley crop upon land which is continually covered with white clover. Shortly before the grain crop is sown, sheep are allowed to hard graze the clover so that it cannot compete with the young cereal plants. The grain is sown by means of a Rotaseeder—a device that is able to cut narrow strips in the clover-turf. The Rotaseeder plants the seed in the cuts without disturbing the clover. The crop is harvested by a combine. One pass with a Rotaseeder replaces three or more journeys with a plough. The integrity of the soil is thus maintained. Compaction is reduced to a minimum. Weeds are kept at bay and pest infestation is very much reduced. The permanent cover of clover provides a safer environment for predatory insects. All of the grain's nitrogen is provided by the clover, which draws it from the air. Growing the clover and cereals together, results in a balanced supply, so that nitrogen is not released at a higher rate than can be taken up by the crop. The potential for groundwater pollution by nitrates is thus eliminated.

(Technical information obtained from "*Green Manure Crops: The organic alternative for improving soils*" by Gardener B. & Morgan W., Department of Agriculture, Victoria, Australia. 1993)

Agro-forestry: Farming with Trees and Shrubs

Trees and large shrubs have been sadly neglected in recent years. All steep slopes should be given over to forestland or copse in order to prevent soil erosion. Selective logging providing wood for fence posts, fuel and building materials. Trees and hedgerows should also be employed as windbreaks where necessary.

Beyond these obvious and widely understood uses of trees and hedgerows, there intelligent deployment can be productive in many, many other ways. Many trees are nitrogen fixing, yield valuable edible berries & nuts, and possess foliage that can provide wholesome rations for cattle, sheep and fowls. The false acacia, for example, is an attractive nitrogen fixing tree which can yield a durable timber, whose seeds can be used for chicken feed, its leaves for cattle forage,

and its flowers are attractive and nourishing for bees. Another example might be the European Ash. Ash trees do not come into leaf until pasture has done more than half of growing for the year. The leaves which are both favoured by and nutritious to animals, also provide shade for them in the summer. Leaf-fall also enhances the fertility of soil. Nuts have been particularly under-utilised in modern agriculture. In comparison to grains only scant attention has been paid to breeding and research. The protein value of nuts is many times greater than that of grains. Once a nut-forest matures it can produce greater yields than annually grown field crops.

Edible hedgerows in Europe and North America might consist of currants, elderberry, hip or romanas roses, sloes and hazel nuts. This edible wind-break can be interplanted with small hedgerow trees, such as Rowan, bird cherry or crab apple to provide a veritable feast of fruit and nuts. Several species of nut tree, such as walnut & chestnut also yield very valuable timbers. Where the topography or poverty demands the farming of steeper slopes, and rock is not available for terracing, many small trees and shrubs can be utilised as hedgerows within integrated contour farming systems. The Farmers on the Indonesian island of Sumba, for example, plant their crops between leguminous hedgerows grown along the contour lines of the hillsides. The various shrubs providing green manure, livestock feed and fuel for cooking.

On poor or tree-cleared pastures - edible trees can be planted in rows several metres apart and used alternatively for grazing and crops down the narrow strips. Tagasaste (Tree Lucerne) is such a useful shrub. It is nitrogen fixing, its foliage is readily consumed by goats, sheep and cattle; its flowers are loved by bees; it can act as an efficient fire-break (as it contains no oils) and is edible as a salad vegetable by humans. Animals which are fed on browse shrubs are also less prone to soil borne parasites which are ingested along with the grass. (Information on Tagasaste from "*Tagasaste (Tree Lucerne): high production Fodder crop*" by L. Snook, Night Owl publications 3rd edition, Victoria, Australia. 1993.)

Beyond the beneficial effects of increasing yields, hedgerows also provide a home for many small native birds and animals. These can play a useful role in natural pest control. At a global level, we know that it is necessary to plant more trees as their trunks act as carbon reservoirs and reduce CO2 levels in the atmosphere. Small trees and shrubs also increase agricultural yields and improve soils. In Australia there are Casuarina and Acacia (Wattles) species that are attracting attention as nitrogen-fixing sources of feed, shelter and green manures. In Europe willows and poplars are again being investigated for waterlogged sites. In India, tree forms of Sesbania species are planted thickly so that the upright stems make formidable fences. They also provide palatable and nutritious foliage for stock and green manures.

Leucaena is a rapid growing, deep rooted, frost-sensitive, nitrogen-fixing

tree that is suitable for a lowland tropical environment. It has proved a great success in many parts of the world, producing a palatable and nutritious feed for cattle. When inter-cropped with conventional crops, significant increases in yield are possible in very poor soils. 'Alley cropping' *Leucaena* bushes has proved successful with corn, yams and rice, all of which benefit from the nitrogen rich *Leucaena* mulch. After cutting there is vigorous growth. The stakes & branches can be easily woven into soil and water retaining fences, which can be used to terrace hillsides. There have been recent discoveries of several giant *Leucaena* varieties. These produce high volumes of wood for fuel and paper. Although *Leucaena* is well suited to small-scale village and household fuel use, large scale energy plantations have been established in several countries. (Information from: "*Leucaena: Promising Forage and Tree Crops for the Tropics*", 2nd Ed, National Academy Press, Washington D.C. 1984).

The introduction of *Calliandra* into Java, Indonesia has been an outstanding success in this respect. *Calliandra* is a small central American tree that shares many of the characteristics of *Leucaena*. It has the added advantage of being able to thrive at much higher altitudes, a characteristic that made it suitable for Java. Java has an acute over-population problem, which has put great stress upon the land. It has become so popular with the peasants that "*Calliandra*" has become a common children's name. This fast growing, nitrogen fixing tree provides excellent wood-fuel, bee forage and a palatable and nutritious foliage that is readily consumed by most animals. (Information from: "*Calliandra: A versatile small Tree for the Humid Tropics*", National Academy Press, Washington D.C. 1983)

The fast growing Giant Paulownia tree has attracted a lot of attention in Australia. This native of China grows at an incredible rate. A cubic metre of light weight timber that is suitable for furniture can be obtained from 1 tree after only 5 years growth. The large leaves can be used as a mulch as well as used as fodder. The bark is however poisonous to animals. The use of paulownias in Alley Cropping agro-forestry systems has proved successful.

It has been suggested that *Leucaena*, Paulownias, and other trees like them, be introduced extensively in areas where eco-systems have been completely destroyed by clear-felling. Whether it is ultimately a good thing that exotic-non-native trees be introduced into bio-regions where they didn't previously exist is certainly highly debateable. Much land, however, has been so completely ruined by blanket logging that it can only support sickly and unpalatable grasses that are useless to most animals and humans. Humans must intervene to make these lands productive once again. Fast growing nitrogen fixing trees can be interplanted with slower growing native ones. The introduced trees being removed before maturity allowing for reforestation by native species. Many of the trees described above have the ability to rehabilitate adverse sites very quickly. Through using them as 'pioneer' trees, they can perform a very useful role, in bio-regionally sensitive, native revegetation projects. Because of global firewood scarcity much

native forest is threatened. Plantations of fast growing agriculturally multi-useful trees could mean that natural forests are spared destruction.

The commercial growing of Hemp is again being sanctioned in Australia. Prohibition of "cannabis" as a drug, has meant that this plant, which is capable of solving global problems, has been foolishly outlawed. Over 25,000 useful products can be made from hemp products. Most people know that Hemp could save forests and pollution. This is due to the fact that high quality paper and cloth are easily made from Hemp. The chemical pollution of woodpulp processing, or the high chemical inputs associated with cotton production, could be eliminated. Hemp has a yield per-acre several times higher than that of trees and does not need to be bleached. The paper is superior to that derived from woodpulp. Hemp clothes are superior to cotton garments in every respect. Moreover, the use of hemp would bring back the rag trade. In olden times most books were printed on paper made from recycled hemp-clothing rags that had been gathered by street collectors. It is less well known that Hemp could easily be used to make car fuel, building materials, nutritious food for both humans and animals (the seed can be used for countless food products like soyabeans), paints and sealants, insulation, cosmetics (massage oil, soaps, lip-balms) as well as bio-plastics. Moreover, unlike other field crops, Hemp has few natural predators, and its deep root system can greatly assist in land reclamation as it draws salt down to deep layers of the earth by reducing the water level. (Information from: *Industrial Hemp: Practical products-Paper to Fabric to Cosmetics* Hemptech, California, 1995).

Farming With Worms

Many farmers still don't appreciate that many important species of earthworms need 2 years (and perhaps as long as 4 years) to complete their burrows and life-cycle. The twice annual ploughing of the soil seriously undermines the long-term rejuvenation of the soil. Considerations such as these have led many gardeners to advocate gardening without digging, through the use of mulch, so that natural soil processes can operate properly and effectively.

We have been foolishly made to believe that we can manage the land better than the small animals that have successfully worked the soils for millions of years. Nothing could be further from the truth! Agri-business, rather than working with nature, has tended to work against it. The twice annual ploughing, chemical fertilisers, inadequate or inappropriate rotation practices and the indiscriminate use of pesticides/fungicides have destroyed the natural biota of the soil. The preservation, fostering or re-introduction of worms into the soil, is regarded by many ecologists as a vital first step in naturally improving productivity and the organic restructuring of degraded lands. Worms have been known to be beneficial to the soil for thousands of years. The reasons for this have only become the subject of detailed scientific study during the last century.

Pastures where worms are absent tend to develop an impermeable root-mat just under the surface. This restricts the entry of water and oxygen. Because they burrow, worms prevent this mat from developing. Their tunnels allow rain-water and oxygen to penetrate easily and deeply into the soil. This is particularly important in more arid countries, such as Australia, where rainfall is unpredictable and run-off represents a serious waste of a precious resource. Plant roots through growing along abandoned tunnels can expand rapidly, as they do not have to force their way through the soil. More remarkably, worms coat their tunnels with a mucus, that is rich in nitrates, so that roots are also naturally fertilised as they grow along them.

Worms are able to transform dead organic matter into minerals that can be utilised by plants. They achieve this through the action of micro-organisms that live within them. In much the same way we require the presence of certain bacteria in our own gut to digest food. In this respect, the ancient Greek philosopher who claimed that worms were the "intestines of the Earth", was exactly right. The majority of these bacteria are soil benevolent. Teams of bacteria progressively transform crude nitrogen into nitrite and finally nitrate (nitrogen and nitrite cannot be taken up by plants) The number of soil-benevolent bacteria put into the surrounding soil through worm castings (vermicast) is truly staggering. A greater abundance of these simple life forms in the soil leads to a greater abundance of larger fungi, insects, spiders and other small soil animals—all of which combine to create a bio-mass many, many times greater than that of the volume of worms contained in the soil.

Most harmful and dangerous bacteria are non-oxygen breathing. They do not survive long in the oxygen-rich environment of the worm's digestive system. Moreover fungi-like bacteria which thrive within worm-rich soil produce natural antibiotics, artificially manufactured varieties of which are commonly used in medicine. The castings (worm poo) themselves, when compared to the surrounding soil contain very, very much higher proportions of available phosphorous, nitrogen, magnesium, carbon and calcium. The concentrations of these vital minerals in castings may not be as high as in artificial fertilisers. They are, however, naturally balanced, and do not therefore go to waste or cause groundwater and river pollution. Vermicast, through bonding mineral granules with (glue-like) polysaccharides, improves the structure of the soil by creating aggregates. The abundant cellulose left within the casts can be used by polysaccharide producing bacteria for a long time after it has been excreted by the worm. Vermicast is not just a natural fertiliser, but a soil conditioner as well.

The use of organic mulches (which restrict weeds and promote worms); the 'direct drilling' of crop plants (rather than ploughing and seeding) so as not to interrupt the life-cycle of the worms; the application of intensively farmed vermicast or the seeding of worm capsules (or eggs if you like) and the 'digging in' of vermicompost (which contains capsules and immature worms) into

wormless soils, is an essential first step in improving the organic quality and productivity of the land. (Information from: *"Earthworms In Australia: A Blueprint for enhancing the environment"*, David Murphy, Victoria, 1993.)

Enriched-land Polyculture

Humanity must learn to use arid and marginal lands efficiently. We should stop using them for large-scale livestock rearing and agriculture. Enriched land polyculture is an alternative. Here edible native fruits and tubers are encouraged within a natural context. This is combined with the free-range ranching of larger native animals. This is by far the most rational approach to marginal, forested or arid lands, in terms of both food production and the conservation of diversity and wilderness. Australians who live in a drought prone country, are only just beginning to understand that the fixed or homestead style of farming is unsuitable. Generation after generation of farmers have failed through periodic drought. Our farmers have seriously degraded the land in the attempt to make a living from a fixed area of farmland. Australian edible native fruits such as the Illawarra plum or the red quandong (and hundreds of others besides, many of which, exhaustive studies have shown to have a much higher vitamin content than imported ones) could be encouraged through enriched land polyculture. These can be gathered along with native animals in times of high rainfall and seasonal abundance over a very wide area of the rangelands.

Even in Europe the potential for enriched polyculture is very great. For example during World War II the shortage of imported fruits in England led people to collect rose hips from the hedgerows. These are very high in vitamin C. Lesser celandine is another very common wayside flower which is remarkably high in vitamin C. In the past it was once collected, and then taken on ships, to prevent scurvy. Scores of different types of nuts, fungi, fruits, leaves, bulbs and berries were once collected from European and American woodlands, many of which are highly nutritious and eaten by a great variety of animals. If edible plants could be encouraged within the context of reafforestation or revegetated Prairie or meadowland, this would not only provide food for game animals and birds, but provide wholesome meat and fruits for us as well.

Water Management

The rational conservation of water, by means of relatively simple technologies, can obtain productive quantities of fruit and grain, in areas which receive less than 100mm (4") of rain annually. By compacting, stabilising and grooving gentle hillsides rainwater can be "harvested" through directing it into a closed storage facility in the valley below. Runoff agriculture was developed almost 4000 years ago in the Middle East. It supported sizeable populations in areas which are now almost deserted (war was the reason they were abandoned rather than technological failure). Modern experiments with runoff agriculture,

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where slopes are treated with wax or even tarmac, such as that constructed just south of the Stirling Range in Western Australia, have proved economically successful. Where agriculture in arid lands has relied upon non-renewable underground reservoirs, rainwater harvesting could represent a method by which they could be recharged, thereby making a non-renewable resource into a renewable one. Micro-catchments, where a tree is placed at the lowest point of the natural terrain, and the land is sculptured to direct water to the base of the tree, have been used in Tunisia for growing olives since ancient times.

Deep-rooted drought resistant fruit trees (e.g. peaches, apricots and figs) have recently been successfully grown by means of micro-catchment in arid countries such as Mexico, Botswana, India, Pakistan and Australia. All hillsides can be sculptured so as to increase the water-holding capacity of the soil by capturing water as high as possible on the land. Ditches or 'swales' are dug on the contour lines which are capable of halting the flow of water downhill, allowing time for it to be absorbed. Any overflowing water is caught in the next swale below it. Generally the steeper the slope, the closer the swales, depending upon the soil structure and erodibility of the land. Swales are able to reduce run-off significantly. When trees and shrubs are placed in front of the swale - marginal sloping land can be made productive without the need for irrigation. The use of swales can make agro-forestry possible where it might otherwise not have been.

One of the major problems of making arid lands productive is the evaporation which occurs in large open reservoirs. Chemical films have generally proved ineffective. The covering of reservoirs with floating slabs of lightweight concrete or wax, does however, show much promise. Evaporation can also be controlled by filling reservoirs with crushed rock or sand. Water loss becomes negligible if the water level remains more than a half a metre below the surface. Sand dams, where rivers which carry large amounts of suitable material in their flood waters can also yield significant quantities of water. The height of the dam is progressively raised by 1-2 metres before each flooding. The fine sediments are carried over the top of the dam but the heavier sands are deposited behind it. Although the geology and time-consuming construction are limiting factors, sand-dams have a proven record of success in many countries.

Solar distillation; mulches made from cardboard coated with organic plastics; pitcher irrigation (where unglazed pitchers are buried to the neck in the soil and periodically filled with water with the seedlings being planted in a circle around them); horizontal wells; improved methods of constructing traditional qanats (an ancient system of underground wells and canals); and efficient and clean methods of recycling waste water are just a few of the many ways in which water could be harvested and conserved in dry and largely unproductive lands. (Information from: *"More Water for Arid Lands"* National Academy Press, Washington D.C. 1974)

Most of these technologies, can however, only be useful upon a small or local scale. The deserts may in time, indeed be 'made to bloom', but this is unlikely to be achieved by industrial agriculture, which was, by in large, developed for fertile soils, in areas blessed with more than adequate rainfall.

One of the most under-utilised resources in much modern agriculture is water. This is a pity. Fish can produce many times the yield of protein that can be obtained by land grazed by sheep or cattle. Swamplands and shallow ponds are frequently drained to make way for housing, recreation facilities and conventional agriculture. In Britain 95% of all original wet-land areas have been drained, a million ponds even by government estimates. The draining of the marsh lands of S. Iraq is the latest example of humankind's unrelenting attack upon the world's wet-lands.

Although the cultivation of fish, crayfish and shellfish is well advanced in many countries, the production of edible aquatic plants has received very little serious study. In tropical countries the further development of edible plant aquaculture could make wetlands productive and save them from indiscriminate and unsuitable developments. Many aquatic weeds and plants have great untapped industrial potential. Reeds (used for thatch and particle board), hyacinths (compost, animal feeds and bio-mass energy) and duckweeds (animal feed) are well known examples. In addition there are many other potential food crops (often cultivated and consumed by people in a particular country or region, but which grow in many, many places) that could be obtained through using our wetlands more intelligently. Watercress (cultivated world wide); Chinese Water Chestnuts and Lotus flowers are familiar products of edible plant aquaculture. There are also several species of edible aquatic fern and algae.

One particularly promising fern is that of Azolla. Because of the presence of a particular blue-green algae which lives in its cavities this tiny plant is able to produce high quantities of nitrogen. By introducing this fern into rice paddies, harvesting it for use as a green manure or as animal feed, productivity can be greatly increased in many instances. In deep water areas in the Tropics, formally considered unsuitable for conventional rice production, experiments with floating rice are proving successful. In temperate areas wild rice has been sadly under-utilised and its market is still restricted to trendy health-food stores. Other temperate plants which have food potential are the Bogbean, Cape Pondweed, Golden saxifrage, Marsh Marigold, Marsh woundwort, Reedmace, Sweet flag, and the Yellow water lily. Taro and swamp taro, is one example of a considerable number of extremely underexploited aquatic tropical plants of great potential value. The leaves and tubers of many of these species are able to outyield land grown crops.

Integrated animal/plant/fish aquaculture

In S.E. Asia pigs are frequently raised in conjunction with aquaculture. Their manure is used to provide food for the fish or edible aquatic plants. Animal barns are constructed on stilts over lakes, so that their faeces fall into the water. The floating aquatic plant, duckweed (which is a very nutritious food) thrives on these wastes and can then be fed to the animals. At the Louisiana State University duckweeds are now being grown on dairy farm wastewater and substituted for alfalfa in dairy and pig feed. The potential for raising fish, poultry and waterfowl for human consumption from duckweed could be sustainably and profitably developed in many parts of the world. More generally, the potential for the integration of fish, animal and vegetable production is very great. In many parts of SE Asia, pig and other animal manure is washed into lagoons stocked with fish such as carp / tilapia; and water spinach which feed on the manure. The water spinach can be fed to the animals and the fish can be eaten by humans. Similar methods of growing water spinach have been developed in densely populated urban areas. In Hong Kong where its cultivation has been perfected, water spinach comprises of about 15% of all the vegetables produced for local markets. Intensively cultivated and fertilised urban lagoons can yield as much as 90, 000 Kg per ha annually. Integrated animal/plant systems when combined with the intelligent use of aquaculture are able to produce several crops in the same space without the addition of imported fertilisers and food-stuffs upon a continual and self-renewing basis. (Information from: "*Making Aquatic Weeds Useful*" National Academy Press, Washington D.C. 1987.)

Sea-Farming (Mariculture)

The sustainable development of sea-farming has become a big environmental issue in India, the South Pacific and South East Asia (especially Indonesia). This has been because of the rapid growth in capitalist shrimp-farming enterprises, (most notably in India) that provide few jobs for locals and destroy local fish stocks. The conversion of mangrove areas to brackish water fish and shrimp ponds has not only depleted the valuable mangrove resources but has also impaired the ecological balance in the estuarine ecosystem. Seaweed farming and the cultivation of giant shell fish, on the other hand are: extensive rather than intensive; provide local employment; far less costly; and environmentally benign (or beneficial). Seaweed farming is the most common marine culture in Indonesia. Seaweed farming requires no chemical or fertilizer inputs, has few adverse environmental effects and is ideally undertaken by coastal rural poor. There is a high demand for the products of seaweed which include agar, algin and carrageenan. These products have applications as thickening, gelling and stabilising agents in food and paint. The products of seafood are also used as ingredients in dental impressions, shampoos, water-proof paper, cloth, glue and as a clarifying agent in the manufacture of wines, beer and coffee. Giant Clams are

very easily farmed and are a valuable and much sought after source of food. Many species are now scarce and some are on the verge of extinction because of over-predation by humans or the wild population. Research shows that it would be relatively easy to farm these creatures. They require no commercial inputs and are grown naturally in clam gardens. They are invaluable in remote Pacific Island locations as they can be stored alive in shallow water as a food larder, to be drawn upon in time of storm or adversity. Giant clam farming, although never undertaken much by South Pacific Islanders, could be one of the few available sustainable industries available to many small island groups/nations. (Information in this section from "*Giant Clams in the Sustainable Development of the South Pacific*" edited by C Tisdell, Australain Centre for International Agricultural Research, Canberra 1992)

Integrated Pest Management

Food and health are emotive issues of great public concern. Many people are deeply worried about chemical residues. Large-scale plantation style farming promotes large-scale pest infestations and the use of chemical controls. The general public is well aware of the health and environmental crisis that modern industrial agriculture is causing. Mothers and parents are demanding that the food that they give their children is healthy, wholesome and uncontaminated. They are increasingly less tolerant of the gung-ho practices of genetic / chemical agriculture. Ever conscious of 'negative public images' the capitalist technocracy has in many places sought to reduce the levels of chemicals used in food production. Public outrage against the residue levels on Tasmania's apples (Australians' favourite fruit) has led the industry to investigate four "alternative" techniques for the control of fungus, moths and mites. Tasmanian apple farmers have introduced predatory mites to control the mite problem, successfully eliminating the need to use miticide. Drawing upon an ancient technique from China the dusting of slake-lime on the leaves alters the pH level under which harmful fungus can grow. This has done much to reduce the need for fungicides. The spraying of the orchard with hormones is now used to interrupt the mating of moths (the hormone makes them unable to locate one another). The development of a much more efficient nozzle has meant that spraying can be effective with greatly reduced amounts of chemicals being used.

We must give due credit to these farmers for attempting to deliver us a statistically less dangerous poisoned apple. But we should not allow ourselves to get too carried away with our applause. Spraying hormones around admittedly sounds different to inorganic chemical spraying. It may indeed provide us with a less chemically adulterated fruit. But do we know if it is likely to be any less harmful to wild insect populations in surrounding eco-systems? A more efficient spraying nozzle means less chemical residue but a chemically contaminated apple nonetheless. The basic problem remains of how to harmlessly control the

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massive infestations that industrial monoculture creates, whilst still wishing to produce our food, according to extensive plantation style techniques.

There are however natural bio-chemical agents which can, and are being used in the same way, as artificial chemical sprays. It has been known for many centuries in India and Burma that during locust plagues the Neem tree was left completely untouched. Most poorer farmers in India and Pakistan place a handful of Neem leaves in their stored grains to protect them from pests. Because of the tree's vigorous growth on many poor soils, it is widely valued. It is an excellent source of fuel, fertiliser, shade and high quality timber. For these reasons it has been deliberately introduced into many countries. In every place it has been introduced people have found new uses and created new products from this extraordinary tree. It's oil is burned in lamps and its bark made into rope in India. It creates beautiful honey. Neem products have a wide range of potential and well-tested medicinal applications. Cake made from Neem seeds creates a good fertiliser which is high in nitrogen, potash, phosphorous, calcium and magnesium. It's wood resembles Mahogany to which it is closely related, therefore providing a fine, termite resistant construction timber. Because of the shortage of tropical hard-wood timber many people have argued that large-scale reafforestation projects, using Neem, should be undertaken on degraded former lowland tropical areas.

It is in its use as an insecticide that most interests us here however. In a recent scientific report it is concluded:

"It's chemical weapons are extraordinary. In tests over the last decade, entomologists have found that Neem materials can affect more than 200 insect species as well as some mites, nematodes, fungi bacteria, and even a few virus. The tests have included several dozen serious farm and household pests - Mexican bean beetles, Colorado potato beetles, locusts, grasshoppers and six species of cockroaches, for example. Neem products have protected stored corn, sorghum, beans, and other food against pests for up to 10 months in some very sophisticated controlled experiments."(p. 3 & 4)

..."The growing accumulation of experience demonstrates the Neem products work by intervening at several stages of an insect's life. The ingredients from this tree approximate the shape and structure of hormones vital to the lives of insects. The bodies of these insects absorb Neem compounds as if they were real hormones, but this only blocks their endocrine systems. The resulting deep-seated behavioural and physiological aberrations leave the insects so confused that they cannot reproduce and their populations plummet. Increasingly, approaches of this kind are seen a desirable methods of pest control: pests don't have to be killed instantly if their populations can be incapacitated in ways that are harmless to people and the planet as a whole...Neem extracts have proved as potent as many commercially available synthetic pesticides. They are effective against dozens of species of insects at concentrations in the parts-per-million range."(Page 39-40)

More remarkably still NEEM may increase worm populations and is benign to

beneficial insects:

"Neem seems remarkably benign to spiders, butterflies & insects such as bees that pollinate crops and trees, ladybugs that consume aphids, and wasps that act as parasites on various crop pests. In the main, this is because Neem products must be ingested to be effective. Thus insects that feed on plant tissues succumb, while those that feed on nectar or other insects rarely contract significant concentrations of Neem products." (Page 58.)

Neem products contain some 2000 chemicals, many of which will probably never be investigated. The complex interaction of all these substances means that insects are unlikely to be able to develop resistance to pure Neem products which contains at least 4 or 5 distinct compounds interacting with 20 others which act as an insecticide. The danger is that the chemical industry will isolate the most active compounds or create synthetic copies, and then apply them individually in high concentrations. In this case they may well develop resistance. (Information from: *Neem: "A Tree for Solving Global Problems"*, National Academy Press, Washington D.C. 1992.)

It will be interesting to see if Neem lives up to its early promise in the expanding 'soft' or 'natural' pesticide market. Neem is not however the first botanical pesticide. Pyrethrins, which are naturally derived from chrysanthemums have been used for 2, 500 years. It is now in short supply as the demand for the convenient 'natural' control of household & garden pests by aerosols has increased. Pyrethrum is an entirely different substance to Neem products. It is a nerve poison that kills the insect out-right and quickly.

Predatory Insects and Parasitoids

When people think of insect control of pest infestations, they immediately think of preying mantids and other large predatory insects. In most cases where insects have been effective in open fields, they have been parasitoid insects, rather than strictly predatory insects. Parasitoid eggs are laid, in or near the eggs of the victim. When they hatch the grubs either eat the eggs or the hatchlings of the victim.

The use of predatory insects in pest control is not a new idea. Ant colonies have been consciously introduced into orchards and plantation forest land in such diverse places as Yemen, China and Germany for several centuries. The modern belief in the power of manipulating predatory insects seems to have originated with the introduction of the Australian ladybird (*Rodolia carinalis*) to control the scales on citrus in 1888 in California. This ladybird remains a remarkably effective in controlling this pest to the present day. The unusual life cycle of this ladybird was however the reason for its success. It acts like a parasitoid rather than just as a predator. This is the main reason for its effectiveness. Most other ladybirds do not exhibit this kind of behaviour, though they will usually not lay eggs in the absence of aphids. Some ladybirds are also remarkable effec-

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tive in controlling pests. This is because plants which have been previously searched without success are apparently recognised by the detection of a chemical marker (specific to each individual).

Mass releases of lacewings when applied to certain crops have been effective against aphids, mealybugs & Colorado beetles. Lacewings (sometimes called the cat of the insect world) can also be brought to the crop area by spraying it with supplementary foods such as brewers yeast and sucrose. Artificial honeydews like that given-off by aphids can also attract larger numbers of ladybirds from the surrounding environment. The interplanting of crops with plants attractive to predatory insects can also prove an effective method for reducing pests. For example, experiments in Texas involving the interplanting of forage sorghums with cabbages resulted in 10-fold increase in the number of green lacewing eggs on the cabbage. The number of eggs laid could be increased still further by the addition of food sprays as an attractant. White Clover attracts parasitic wasps which eat aphids and scales. The clover can also be used as a green manure and as a living mulch. Alfalfa can attract assassin bugs, parasitic wasps and ladybirds. Alfalfa is also a leguminous and deep rooted nutrition cyclor (especially iron) that can be used as an orchard ground cover, mulch or animal forage.

Interest in predatory insects has grown rapidly in recent years. Success out-side the laboratory has however been extremely haphazard. Research has tended to concentrate on insects which aggregate strongly around prey—such as predatory mites and ladybirds. Predatory insects have proved successful in limited environments such as glasshouses. Those people who have attempted to grow marijuana by means of a hydroponic light system may well have resorted to introducing the predatory mite, *Phytoseiulus persimilis* to control two-spotted mites (*Tetranychus urticae*), which are a troublesome pest which is difficult to control by chemical means. Likewise, Green Lacewings (*C. carnea*) have proved effective against aphids on asparagus, celery, lettuce, cucumbers and capsicum when grown under glass. Unfortunately many potentially useful predators, such as beetles, prefer to hunt on the ground, and do not climb up to the top of the plant. This is where the pest are usually present in large numbers and can do the most damage. Cannibalism, temperature change, synchronisation of the life-cycle of the prey & predator, the presence of alternative prey, and difficulties in the mass production in the laboratory, are just some of the many other variables that may dramatically affect the usefulness of predatory insects as a method of pest control.

On the whole the introduction of predatory insects does not completely control the pest in question and usually has to be integrated with conventional chemical spraying. At the level of the communal vegetable patch or domestic garden however, the ability to obtain a box of lady-birds or mantids and release them in the garden may in due course represent an effective method of control-

ling insect pests at a small and very local level without the use of toxic chemicals. A recent success story is that of a pecan nut farmer in Moree (far north N.S.W.) This large plantation of over 60,000 trees that supplies nuts to the health food industry was threatened by the stem girdler moth. This moth rings the bark of the fruiting branches of the tree at the caterpillar stage. Because the health food market demanded a chemical-free product the producer was forced to search for alternative control methods. A small parasitoid wasp, which impregnates the moths' eggs with its own is now sprayed by airplane over the plantation at a rate of 100 million wasps a week. The wasps are raised in an on-site laboratory. It has proved to be completely effective in controlling moth caterpillar infestations. Parasitoid wasps have also been successfully used to control pests on cotton crops on irrigated land on the Ord River (N.W. Australia). The effective use of an introduced moth has almost controlled the invasive pest weed, Prickly Pear. This had proved an intractable pest-weed throughout the whole of the Australian continent. Similar experiments with central american fungus, boring grubs and beetles are, in the light of the success with prickly pear, being conducted to control the mimosa shrub, which could in time seriously threaten the ecology of large areas of Northern Australia.

We may expect many breakthroughs in the newly emerging science of predatory and parasitoid control of pest species. Large scale pest infestation is, however, the result of monocultural food production. The need to consider the introduction of massive numbers of predatory insects is a direct consequence of large-scale industrial production of our food. The greater the diversity of plants upon the land the more difficulty pest insects have of locating suitable hosts upon which to feed or lay their eggs.

It would perhaps be far more profitable to diversify and down-scale our methods of food production so that natural mechanisms of balance between 'competing' insects may be allowed to operate more effectively. More generally, farmers have to get used to seeing a wide variety of creepy crawlies in their fields. They must gain an intimate understanding of the life-ways and interactions of all of them. Most insects, it will be found, being neither beneficial nor harmful to food production. These insects provide food for a wide variety of birds and small animals, many of which have sadly disappeared from our fields, and which may have had an unknown role in controlling pest species.

Harmful or undesirable pest animals, such as mice, fruit bats or coyotes, also need to be controlled naturally and effectively. In the past, Barn-owls were encouraged to nest in especially constructed farm buildings, in many parts of Europe, to control mice. These were replaced this century by chemical poisons. These had the effect of not only killing the mice, but the owls, which ate the dead rodents, before they could be removed. Thankfully in Malaysia these beautiful creatures have been successfully reintroduced onto farms to control mice. Their numbers have doubled in recent years in this country. Unlike the wolf, the Ameri-

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can coyote adapted perfectly to the agricultural and grazing practices of the European invaders. Up until the present, the war against the coyote has been waged by the gun, poison and traps. Millions of other animals have died from poisons or in traps intended for coyote. Recently however experimenters have found that coyotes will not go near dogs that are larger than them. By socialising dogs with sheep they can be trained to live with the flock and protect them from coyotes. In Australia similar experiments have proved successful in protecting flocks from foxes, dingoes and wild-dogs. Many other animals can be used to control weeds and insect pests. Ducks have been used for thousands of years in paddy fields to control mosquitoes and burrowing crabs.. Geese will avoid all broad-leafed plants and can be used to weed fields.

The fruit-bat (an important polinator and seed disperser of trees in tropical countries) is a major agricultural pest in many parts of Australia. Shooting, netting, and poisoning have been traditional responses to the problem. One clever and observant cashew-nut farmer in Australia has however managed to imaginatively solve his problem. The Cashew nut is a curious thing. It grows on the end of a the cashew apple that sustains the young tree after germination. The edible apple has not been widely eaten, despite being several times higher in vitamin C than oranges. The apple, not the nut, is attractive to the bat, and having taken the whole fruit to a roosting tree, in nearby bushland, proceeds to eat the apple, whilst leaving the nuts to fall to the ground. More remarkably, is that the same bat will always use the same tree. By simply planting suitable roost trees, in or around the orchard, the farmer found, that he could collect the nuts, from the ground, once the bats had discarded them. Here, through thinking laterally, the farmer not only obtained the 30% of his crop, that had previously been lost to bats, but got them to pick them for him! There are as many pest control problems as there are farms. Each situation will most likely require its own unique solution. What is certain however is that the gun, bait & trap must be replaced by imagination and an honest attempt to work with nature. (Technical information at begining of section from: *"Insects as Predators"* by T. R. New, The University of NSW Press & Australian Institute of Biology, 1991. For least toxic solutions for your home, garden, pets and community, the following book is highly recommended: *"Common-Sense Pest Control"* by W & H Olkowski and S. Daar, Taunton Press, CT, 1991 2nd printing 1992)

CONCLUSION

Although it is tempting to get depressed about contemporary attitudes towards the land, times are undoubtedly a-changing. The small-holder in the third-world who used to use five hectares of land to grow rice—and after paying for seed, insecticide and water—was left with nothing—now understands the need for survival through horticulture and diversity. By using fruit trees for shade; by keeping chickens, ducks and geese to eat the bugs and weeds; mulch to con-

serve water and build up the organic vitality of the soil; the horticulturalist not only obtains fresh eggs, fruit, vegetables and meat, but also manages to produce surplus to sell. The increasing popularity of the permaculture movement, and many other similar organisations, is indicative of the fact that more and more people, all over the world, are beginning to understand the enormously productive and empowering potential of proper landscaping and the intelligent application of small-scale, intensive and diverse organic horticultural techniques to the land. More and more people now understand that the plantation approach to the land is the deathly product of colonisation and corporate expansionism of yesteryear. Organic horticulture is the healthy and integrated approach to food production of the future.

The waterless toilet; increasingly efficient composting methods; more detailed knowledge of micro-biological processes; and a desire to live in harmony with the Earth, will, we hope, lead to return to the land unprecedented in the twentieth century.

At the same time we cannot ignore the unrelenting encroachment of corporate agri-business continues. One of the promises made by the Mexican government in order to join the North American "free-trade-zone" is to corporatise the peasant small holdings—won from the great landowners, with great loss of blood, in the great Mexican Revolution. The new Zapatistas launched their uprising on January 1st 1993, (after ten years preparation and education through consensus by the Chiapas southern region Indians) to oppose the NAFTA. The revolt has at its core, the war cry: Land & Liberty (Tierra y Libertad!).

In many parts of America and Europe the countryside is virtually deserted. Only a very few percent of the population is directly concerned with agricultural production. No one has trodden on the fields for years, although they are increasingly compacted by massive harvesters and tractors every year. A farm with enough land to supply an entire village is no longer seen as viable by the slick executives of an anonymous city-based holding company. If humanity is not to allow the whole of (so-called) civilisation to be swept away in a swirl of dust, then it must reclaim the land and soil from these state and capitalist hooligans. Humanity must reverse the agricultural revolution. The ancient and trusted art of the gardener, is at last achieving its due recognition, as one of the most noble and healthy, of all the human professions.